REMARKS

Claims 1-94 are pending in action, with claims 1, 14, 26, 37, 48, 61, 73, and 84 being independent. Claims 1, 14, 26, 37, 48-73, and 84 are amended. No new matter has been added. Support for the amendments to claims 1, 14, 26, 37, 48, 61, 73, and 84 can be found in the specification, for example, on pages 8-9, ¶ [0026].

Claims 48-72 are rejected under 35 U.S.C. 101 for allegedly being directed to non-statutory subject matter, particularly a computer program.

Claims 1-4, 14-17, 26-28, 37-40, 48-51, 61-64, 73-75, and 84-87 are rejected under 35 U.S.C. 102(e) as allegedly being unpatentable over Kadous et al. (U.S. Patent 6,636,568).

Claims 5-13, 21-24, 29-35, 41-47, 52-60, 65-72, 76-83, and 88-94 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Kadous in view of Gesbert, et al. From Theory to Practice: An Overview of MIMO Space-Time Coded Wireless Systems, IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 21, NO. 3, APRIL 2003, and in further view of Rietz, College Algebra pages 186-187, Henry Holt and Company, 1909.

Claims 18, 41, 65, and 88 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Kadous in view of Gesbert, and in further view of Rietz.

Applicants respectfully traverse the rejections and request reconsideration in view of the amendments above and the following remarks.

Section 101 Rejections

Claims 48-72 are rejected under 35 U.S.C. 101 for allegedly being directed to non-statutory subject matter, particularly a computer program. While Applicants believe the claims as presented are directed to statutory subject matter, in an effort to advance prosecution, Applicants have amended these claims to recite a "computer-readable medium" having instructions stored thereon, which, when executed by a processor, causes the processor to perform operations recited in these claims.

In view of these amendments, Applicants respectfully request that the rejections to claims 48-72 under 35 U.S.C. 101 be withdrawn.

Section 102 Rejections

Claims 1-4, 14-17, 26-28, 37-40, 48-51, 61-64, 73-75, and 84-87 are rejected under 35 U.S.C. 102(e) as allegedly being unpatentable over Kadous et al. (U.S. Patent 6,636,568). Applicants respectfully traverse the rejection.

Claim 1 and its dependent claims

Claim 1 previously recited, in part, receiving a selected spatial multiplexing rate, the spatial multiplexing rate corresponding to one or more mapping permutations; and for each of a plurality of data tones, mapping one or more of a plurality of data symbols to a plurality of antennas using a corresponding one of the one or more mapping permutations.

In the statement of rejection, Examiner asserts that Kadous discloses a method and apparatus for receiving a selected spatial multiplexing rate, the spatial multiplexing rate corresponding to one or more mapping permutations; and for each of a plurality of data tones, mapping one or more of a plurality of data symbols to a plurality of antennas using a corresponding one of the one or more mapping permutations. *See*, page 2 of Office Action. For at least the reasons set forth below, Applicants respectfully disagree with this characterization.

Kadous discloses "each data stream is transmitted over a respective transmit antenna." *See*, col. 3, lines 59-65. "A separate data rate and coding and modulation scheme may be used for each of the N_T data streams to be transmitted on the N_T transmit antennas." *See*, col. 16, lines 10-20. "Each transmitter receives and processes a respective … transmission symbol stream … to generate a modulated signal, which is then transmitted from the associated antenna." *See*, col. 17, lines 11-15.

Kadous is understood to only disclose that each antenna transmits a data stream received from a respective transmitter at a selected rate. Kadous is not understood to teach or suggest at least the following: a spatial multiplexing rate, mapping permutations for mapping one or more of a plurality of data symbols to a plurality of antennas, or the use of mapping permutations.

Spatial Multiplexing Rate

Kadous shows that each of the N_T data streams, to be transmitted over N_T antennas, can have a separate data rate. Kadous provides no teaching of a spatial multiplexing rate. Kadous only describes an individual data rate for each repective transmitter.

Mapping Permutations

Because each of the data streams can be transmitted at separate data rates on N_T separate transmit antennas, each of Kadous' N_T data streams can only be transmitted on a single antenna. Applicants claimed one or more mapping permutations are used to map one or more of a plurality of data symbols to a plurality of antennas in accordance with the spatial multiplexing rate. Applicants respectfully submit that Kadous does not teach or suggest a mapping to a plurality of antennas. As discussed above, each stream in Kadous is transmitted by a single antenna. Applicants' claimed method recites for each of a plurality of data tones, mapping one or more of a plurality of data symbols to a plurality of antennas using a corresponding one of the one or more mapping permutations. Therefore, Kadous does not teach or suggest the method of claim 1.

Nevertheless, Applicants have amended claim 1 to recite, in part, receiving a selected spatial multiplexing rate, the spatial multiplexing rate corresponding to a plurality of mapping permutations; and for each of a plurality of data tones, mapping one or more of a plurality of data symbols to a plurality of antennas using a corresponding one of the plurality of mapping permutations. For at least the same reasons set forth above, Kadous does not teach or suggest a spatial multiplexing rate, mapping permutations for mapping one or more of a plurality of data symbols to a plurality of antennas, or the use of mapping permutations.

For at least the foregoing reasons, Applicants respectfully request that the rejection to claim 1 under 35 U.S.C. 102(e) be withdrawn. Claims 2-4 depend from claim 1 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 1.

Claim 14 and its dependent claims

Claim 14, as amended, is directed to a method wherein each data tone includes one or more of a plurality of data symbols mapped according to a corresponding one of a plurality of mapping permutations, and wherein the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least the same reasons set forth above with respect to claim 1, claim 14 is allowable over Kadous.

Claims 15-17 depend from claim 14 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 14.

Claim 26 and its dependent claims

Claim 26, as amended, is directed to an apparatus and includes the selected multiplexing rate corresponding to a plurality of data symbols and a plurality of mapping permutations, and mapping one or more of the plurality of data symbols to a plurality of antennas using a corresponding one of the plurality of mapping permutations. For at least the same reasons set forth above with respect to claim 1, claim 26 is allowable over Kadous.

Claims 27-28 depend from claim 26 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 26.

Claim 37 and its dependent claims

Claim 37, as amended, is directed to an apparatus wherein each data tone includes a plurality of data symbols mapped according to a corresponding one of a plurality of mapping permutations, and wherein the plurality of data symbols and the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least the same reasons set forth above with respect to claim 1, claim 37 is allowable over Kadous.

Claims 38-40 depend from claim 37 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 37.

Claim 48 and its dependent claims

Claim 48, as amended, is directed to a computer-medium and includes receiving a selected spatial multiplexing rate, the spatial multiplexing rate corresponding to a plurality of mapping permutations; and for each of a plurality of data tones, mapping one or more of a plurality of data symbols to a plurality of antennas using a corresponding one of the plurality of mapping permutations. For at least the same reasons set forth above with respect to claim 1, claim 48 is allowable over Kadous.

Claims 49-51 depend from claim 48 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 48.

Claim 61 and its dependent claims

Claim 61, as amended, is directed to a computer-medium wherein each data tone includes one or more of a plurality of data symbols mapped according to a corresponding one of a plurality of mapping permutations, and wherein the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least the same reasons set forth above with respect to claim 1, claim 61 is allowable over Kadous.

Claims 62-64 depend from claim 61 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 61.

Claim 73 and its dependent claims

Claim 73, as amended, is directed to an apparatus and includes means for selecting a spatial multiplexing rate from a plurality of available spatial multiplexing rates, the selected spatial multiplexing rate corresponding to a plurality of data symbols and a plurality of mapping permutations; and means for space frequency coding a symbol for transmission, said coding comprising, for each of a plurality of data tones, mapping one or more of the plurality of data symbols to a plurality of antennas using a corresponding one of the plurality of mapping permutations. For at least the same reasons set forth above with respect to claim 1, claim 73 is allowable over Kadous.

Claims 74-75 depend from claim 73 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 73.

Claim 84 and its dependent claims

Claim 84, as amended, is directed to an apparatus wherein each data tone includes a plurality of data symbols mapped according to a corresponding one of a plurality of mapping permutations, and wherein the plurality of data symbols and the plurality of mapping permutations correspond to a selected spatial multiplexing rate. For at least the same reasons set forth above with respect to claim 1, claim 84 is allowable over Kadous.

Claims 85-87 depend from claim 84 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 84.

Section 103 Rejections

Claims 5-13, 21-24, 29-35, 41-47, 52-60, 65-72, 76-83, and 88-94 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Kadous et al. in view of Gesbert, et al. From Theory to Practice: An Overview of MIMO Space-Time Coded Wireless Systems, IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 21, NO. 3, APRIL 2003, and in further view of Rietz, College Algebra pages 186-187, Henry Holt and Company, 1909. Furthermore, claims 18, 41, 65, and 88 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Kadous in view of Gesbert, and in further view of Rietz. Applicants respectfully traverse the rejections.

Claims 5-13

Claims 5-13 depend from claim 1 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 1.

Claim 5 is separately allowable for at least the following additional reasons. Claim 5 recites, in part, the plurality of mapping permutations comprise $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. Examiner acknowledges that Kadous is silent in teaching of a spatial multiplexing rate corresponding to the mapping permutations of $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$, where M is the spatial multiplexing rate and M_T is the number of antennas.

Gesbert does not cure the deficiencies of Kadous. Gesbert discloses mapping each symbol stream onto one of a multiple TX antennas. *See*, page 282, Principles of Space-Time (MIMO) Systems, ¶ 1. Each TX antenna sees a differently encoded, fully redundant version of the same signal. *See*, page 287, General Principles, ¶ 3-4. A number of code symbols equal to the number of TX antennas are generated and transmitted simultaneously, one symbol from each antenna. *See*, page 287, General Principles, ¶ 3-4. *N* code symbols are transmitted simultaneously from *N* transmit antennas. *See*, page 288, Maximizing Diversity with STTC, ¶ 1.

Contrary to Examiner's assertion, Gesbert only discloses transmitting *N* code symbols from *N* antennas. Gesbert does not teach or suggest *M* is the spatial multiplexing rate. Furthermore, because Gesbert does not distinguish among the *N* code symbols and the *N* antennas, Gesbert also teaches away from mapping permutations or the use of mapping permutations. Gesbert only discloses that there are an equal number of code symbols and antennas and that each antenna transmits a code symbol. Alternatively, the method of claim 5 recites the plurality of mapping permutations comprise $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. For at least these reasons, Gesbert does not teach or suggest mapping permutations, nor the use of such permutations. Therefore, Kadous and Gesbert, alone or in combination do not teach or suggest the method of claim 5.

Furthermore, Rietz does not cure the deficiencies of either Kadous or Gesbert. Rietz discloses that the number of combinations of *n* things taken *r* at a time equals *n*! / [*r*! x (*n*-*r*)!]. *See*, page 187, Section 134. Rietz only discloses the algebraic definition of combinations of things all different. Because Gesbert discloses transmitting *N* code symbols from *N* antennas, even a combination of Gesbert with Rietz would always yield one permutation. This permutation describes transmitting one code symbol from each antenna; it does not teach or suggest the plurality of mapping permutations of claim 5. Therefore, Kadous, Gesbert, and Rietz, alone or in combination do not teach or suggest the method of claim 5.

Claim 8 is separately allowable for at least the following additional reasons. Claim 8, recites in part, the mapping permutations are applied to the plurality of data tones in a cyclical manner.

In the statement of rejection, Examiner asserts that Rietz discloses the nature of the permutation mapping is cyclical. *See*, page 5 of Office Action. Applicants respectfully disagree. Rietz only discloses the algebraic definition of combinations of things all different. Calculating the number of combinations of *n* things taken *r* at a time does not teach or suggest applying permutations in a cyclical manner. Order is relevant to both permutations and cycles. Rietz teaches away from applying permutations in a cyclical manner because combinations ignore

order. Examiner does not assert, and neither Kadous nor Gesbert disclose, the mapping permutations are applied to the plurality of data tones in a cyclical manner. Therefore, Kadous, Gesbert, and Rietz, alone or in combination do not teach or suggest the method of claim 8.

Claim 18

Claim 18 depends from claim 14 and also is submitted to be allowable for at least the same reasons set forth above with respect to claim 14.

Claim 18 is separately allowable for at least the following additional reasons. Claim 18 is directed to a method and includes the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M!\times(M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 18 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 21-24

Claims 21-24 depend from claim 14 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 14.

Claim 21 is separately allowable for at least the following additional reasons. Claim 21 is directed to a method and includes mapping permutations that are applied to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 21 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 29-35

Claims 29-35 depend from claim 26 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 26.

Claim 29 is separately allowable for at least the following additional reasons. Claim 29 is directed to an apparatus and includes the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M!\times(M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and

M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 29 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claim 31 is separately allowable for at least the following additional reasons. Claim 31 is directed to an apparatus and includes the coding module that is operative to apply the mapping permutations to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 31 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 41-47

Claims 41-47 depend from claim 37 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 37.

Claim 41 is separately allowable for at least the following additional reasons. Claim 41 is directed to an apparatus and includes the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 41 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claim 44 is separately allowable for at least the following additional reasons. Claim 44 is directed to an apparatus and includes mapping permutations are applied to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 44 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 52-60

Claims 52-60 depend from claim 48 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 48.

Claim 52 is separately allowable for at least the following additional reasons. Claim 52, as amended, is directed to a computer-medium including the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial

multiplexing rate and M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 52 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claim 55 is separately allowable for at least the following additional reasons. Claim 55, as amended, is directed to a computer-readable medium and includes mapping permutations that are applied to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 55 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 65-72

Claims 65-72 depend from claim 61 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 61.

Claim 65 is separately allowable for at least the following additional reasons. Claim 65, as amended, is directed to a computer-medium including the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 65 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claim 68 is separately allowable for at least the following additional reasons. Claim 68, as amended, is directed to a computer-readable medium and includes mapping permutations that are applied to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 68 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 76-83

Claims 76-83 depend from claim 73 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 73.

Claim 76 is separately allowable for at least the following additional reasons. Claim 76 is directed to an apparatus including the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 76 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claim 78 is separately allowable for at least the following additional reasons. Claim 78 is directed to an apparatus and includes the coding module operative to apply the mapping permutations to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 78 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claims 88-94

Claims 88-94 depend from claim 84 and also are submitted to be allowable for at least the same reasons set forth above with respect to claim 84.

Claim 88 is separately allowable for at least the following additional reasons. Claim 88 is directed to an apparatus including the plurality of mapping permutations comprising $\binom{M_T}{M} = \frac{M_T!}{M! \times (M_T - M)!}$ mapping permutations, wherein M is the spatial multiplexing rate and M_T is the number of antennas. For at least the same reasons set forth above with respect to claim 5, claim 88 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Claim 91 is separately allowable for at least the following additional reasons. Claim 91 is directed to an apparatus and includes the mapping permutations that are applied to the plurality of data tones in a cyclical manner. For at least the same reasons set forth above with respect to claim 8, claim 91 is allowable over Kadous, Gesbert, and Rietz, alone or in combination.

Conclusion

By responding in the foregoing remarks only to particular positions taken by Examiner, Applicants do not acquiesce with other positions that have not been explicitly addressed. In addition, Applicants' arguments for the patentability of a claim should not be understood as implying that no other reasons for the patentability of that claim exist.

Applicants respectfully request that all pending claims be allowed. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: November 14, 2007

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